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I.R.I.'s 1988 R&D TRENDS SURVEY

R&D managers are cautiously optimistic on the outlook for 1988:

- 79% of the respondents indicate the same or slightly more R&D spending in 1988 compared with 1987.
- 81% of the respondents plan little or no change in R&D capital spending.
- 67% of respondents will maintain R&D subcontracting at the same or slightly greater level.
- University-funded R&D will also be maintained at the same or slightly greater level by 70% of the respondents.

Indeed, for every single question asked in I.R.I.'s fourth annual survey of industrial research trends (see tabulation), by far the greater number of responses turn up in the column for "approximately the same." If we compare the distribution about this central point, there tends to be a slightly larger number of responses on the "more" side rather than on the "less," and it is for this reason that we would characterize R&D managers as "cautiously optimistic."

This survey was conducted by sending questionnaires to the official representatives of 247 U.S. member companies of I.R.I. Replies were received from 148, a 60% response. Respondents were asked to give their best present estimate of the relative change they saw ahead for 1988, compared with 1987, in several areas of R&D activity. A scale of 1-5 was used, with 1 representing "significantly less" (-5 percent or less compared with 1987), 2 "slightly less" (0 to -5 percent), 3 "approximately the same" (1-5 percent), 4 "slightly more" (6-15 percent), and 5 "significantly more" (more than 15 percent). Respondents could also check "NA" for "not applicable" and "NR" for "not important to you."

The expectation for capital expenditures is up relative to what was reported in 1987, but R&D expenditures as a percent of sales are essentially constant. As far as operational costs per R&D professional are concerned, it is surprising to find that our managers are predicting only a 1 percent increase for 1988 over 1987. We have used weighted averages to determine these numbers, and thus a different figure is obtained than if a simple averaging is done of the figures in the table. A more interesting question is, "why are the numbers reported in 1987 slightly over $140,000 whereas the predicted figure for 1987 was only $125,000?"

Each year over the past four years, R&D managers have been asked to predict the operational costs per R&D professional, and the R&D expenditures as a percent of sales for the forthcoming year, as well as reporting the same figures for the current year.

Table 1. Industry Breakdown

	R&D as % of Sales		Operational Costs of R&D Professionals (x $000)		Capital Expenditures for R&D as % of budget		
	1987	1988	1987	1988	1986	1987	1988
Chemicals (35 companies)	3.8	3.9	140	146	11.6	12.3	13.5
Electriical (12 companies)	6.1	6.0	163	166	14.7	17.0	15.6
Food (10 companies)	1.0	1.1	144	137	12.9	13.9	14.0
Machinery & Fabricated Metal (13 companies)	2.7	2.7	142	148	9.6	8.8	9.4
Paper & Allied Products (9 companies)	1.8	2.0	127	128	11.2	18.7	13.6
Petroleum (9 companies)	.9	.9	170	166	10.3	10.5	10.8
Pharmaceuticals/Personal Products (13 companies)	6.0	5.7	126	126	12.4	14.3	17.7
Primary Metals (7 companies)	.9	.9	144	146	8.0	9.1	11.4
Others (23 companies)	3.8	3.8	132	130	16.5	15.3	16.1

Comparison of the figures shows that R&D managers generally predict almost no change in the next year from the figures that are reported for the current year. On operational costs, the general number predicted is the current number plus inflation. As a percent of sales the predicted number is, generally speaking, the current number $\pm$0.1 percent.

There are some puzzling fluctuations in the figures. For example, in a number of industries the predicted costs for 1986 and estimated costs for 1985 are substantially different from those reported and predicted the year before and the year after. One would expect a smooth trend over the three years and not the ups and downs which are reported. It is possible that, within the same industry group, different corporations are reporting in the different years. It is hard to visualize any other explanation for these unexpected fluctuations.

Generally speaking, costs per R&D professional have risen at a rate greater than the rate of inflation. Possible exceptions to this trend are in the petroleum and primary metal industries, although the data are confused by one of the four years being significantly off any trend line. At least for these industries the upward trend is much less pronounced.

R&D as a percent of sales would appear to be relatively invariable for most industries. A possible exception is in the pharmaceutical area where there appears to be a significant downward trend. Another anomaly appears in the primary metals area where spending would appear to be substantially higher

in 1985 and 1986 than in 1984 and 1987. Again, the reason for this apparent anomaly is unclear.

With this four-year data we can make some comparisons between industry groups. For example, the cost per R&D professional seems to be substantially lower in the pharmaceutical companies than in all others. In the petroleum companies it is higher, although the electrical group appears to be bent on catching up with the petroleum group. The other three industry groups seem to be incurring very similar overall costs.

There appears to be no correlation between costs of an R&D professional and the R&D spending as a percent of sales. Thus we find electrical and pharmaceutical are the highest spenders for R&D as a percent of sales, and yet one of them has the lowest reported costs per R&D professional while the other has one of the highest.

Surprisingly such different industries as food, petroleum, and primary metals all spend about 1 percent of their sales dollars on R&D.

Some new questions were asked this year. For example, the respondents were requested in questions 13 and 14 to comment on top management attention to research and development, respectively. The data suggest that top management attention may be focused a little more on development than on research and that R&D managers expect increasing attention to their portfolio from top management.

Managers' predictions regarding participation in consortia for precompetitive university research, and in alliances and joint ventures for R&D, were tested in questions 15 and 16. A surprising 20 percent of the respondents indicated that participation in university research consortia was not applicable, while only 13 percent said "non-applicable" for participation in alliances and joint ventures for R&D. Forty-two percent of the respondents expected to see somewhat more activity in alliances and joint ventures for R&D. This would suggest that R&D managers see more benefit in working with their industrial colleagues rather than with university professors.

Recently, the Research-on-Research Committee of the I.R.I. has been focusing on federal laboratories as an untapped technology resource. Question 20 was included for this reason. It should be a matter of concern that some 22 percent of the respondents do not believe that contacts with federal laboratories are useful to their businesses, or at least to their R&D portfolios.

The last new question was 21 on overhead costs. The "approximately the same" response for this question is very high. It compares with the even higher centrist trend in question 2 on the ratio of direct salaries and wages to other direct R&D costs. Perhaps the status quo for this cost ratio is related to pressure from top management.

Finally, the response rate of 60 percent is the highest return in the four years. Previous returns were 59, 50, and 51-1/2 percent for the first, second, and third surveys, respectively. This fluctuation in response rate may or may not be significant, but there is one correlation. The first survey, which had a 59 percent response, and the current one are optimistic. On the other hand, surveys two and three were rather pessimistic regarding trends in R&D spending. Does this mean that the response rate is higher when the climate is relatively good? The reader will have to make his own judgments.

Acknowledgement

The R-o-R Committee thanks all those who took their valuable time to participate in the survey, Eliot Steinberg of the I.R.I. staff for data reduction, and Peter McGeer of Alcan International for preparing the descriptive analysis. The next survey will be conducted in mid-1988.

Table 2. Survey Questionnaire Results

Expected Changes in 1988 Compared with 1987 Experience	Relative Change (# of responses)						
	NA	1	2	3	4	5	NR
Expenditures							
1. Total R&D expenditures	0	7	20	64	53	4	0
2. Ratio of direct salaries and wages to other direct R&D costs	0	3	9	125	11	0	0
3. Capital spending for R&D operations	0	13	25	62	33	15	0
4. Subcontracting R&D to outside commercial organizations	11	6	24	63	35	7	2
5. Grants, contracts, etc. for university R&D	9	7	20	76	34	5	1
Effort Allocation							
6. Relative distribution of R&D costs:							
a. Support of existing business	0	2	14	95	33	4	0
b. Directed basic research*	14	6	22	67	29	5	4
c. New-business projects	3	8	18	62	51	5	0
7. Ratio of non-centralized (e.g., divisional) to centralized corporate R&D efforts	19	3	11	88	19	2	4
8. Outside-customer technical-service efforts to total R&D (in time or dollars)	11	3	12	82	33	4	3
9. R&D efforts in response to existing or proposed legislation, standards, or other governmental rules (in time or dollars)	3	2	10	93	31	5	1
Personnel Trends							
10. R&D professional manpower level	0	8	21	76	40	3	0
11. Hiring new graduates	3	6	17	85	33	3	0
12. Retraining of professionals	5	2	13	86	35	1	1

(continued)

Table 2 (continued)

Expected Changes in 1988 Compared with 1987 Experience	Relative Change (# of responses) NA	1	2	3	4	5	NR
Other Trends							
13. Top management attention to Research on longer term or strategic issues	1	5	10	60	62	10	0
14. Top management attention to Development	0	0	3	69	67	9	0
15. Participation in consortia for precompetitive university research	30	1	18	67	29	1	2
16. Participation in alliances and joint ventures for R&D	19	0	4	57	63	4	1
17. Licensing technology from others (dollar volume)	13	2	5	90	34	2	2
18. Licensing technology to others (dollar volume)	13	5	5	85	37	1	2
19. Extent of government financial support of R&D	44	3	8	51	32	6	4
20. Contacts with Federal Laboratories	33	3	4	70	28	7	3
21. Overhead cost	0	7	26	91	24	0	0

Quantitative Data

22. What is your capital expenditure for R&D as a percent of your R&D Budget?
    1986 12.4% 1987 13.5% 1988 13.9%

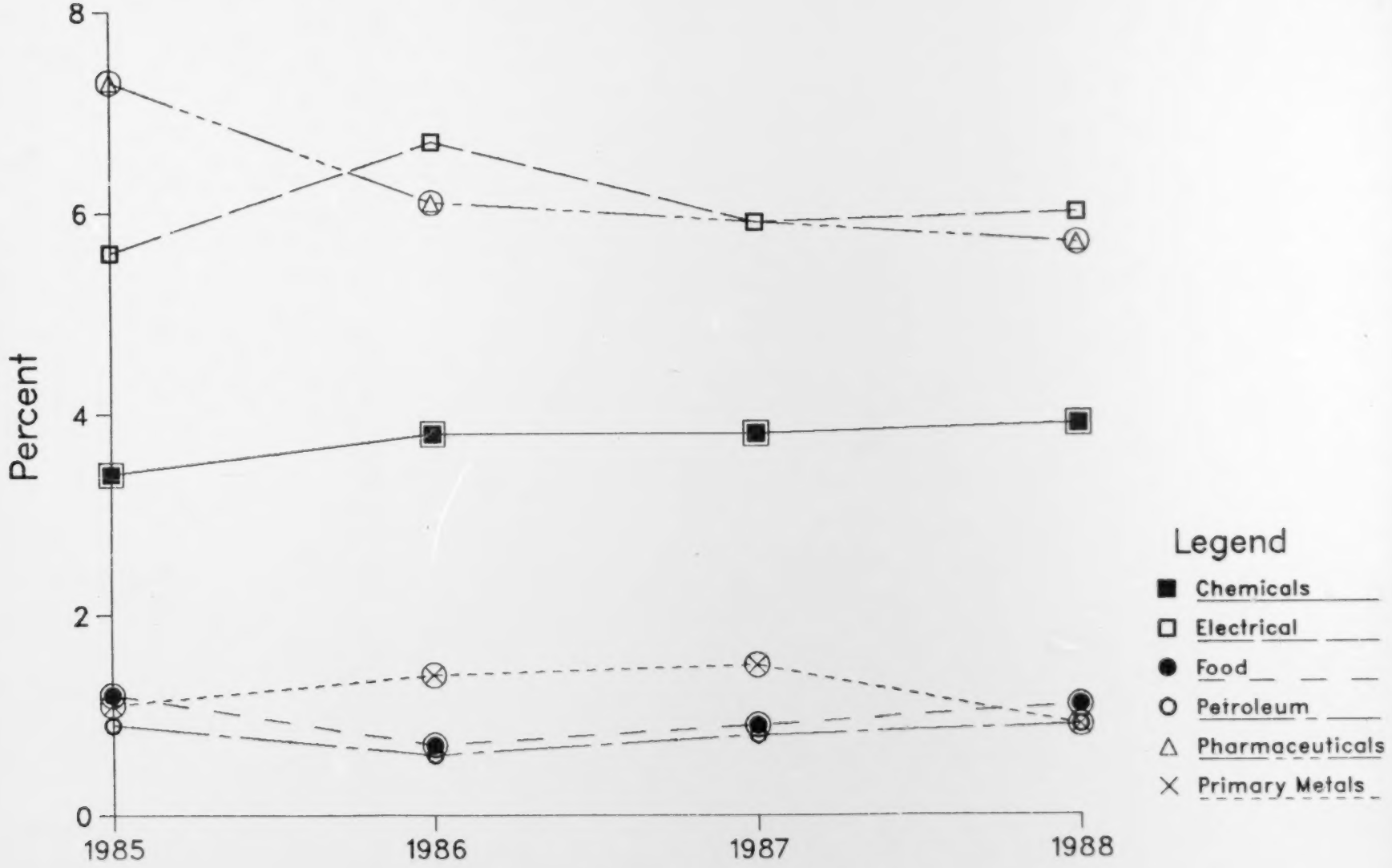
23. R&D expenditures as percent of sales: 1987 3.3% ; anticipated for 1988 3.3%

24. Operational costs per R&D professional**
    a. for 1987: $141,200
    b. estimate for 1988: $142,700

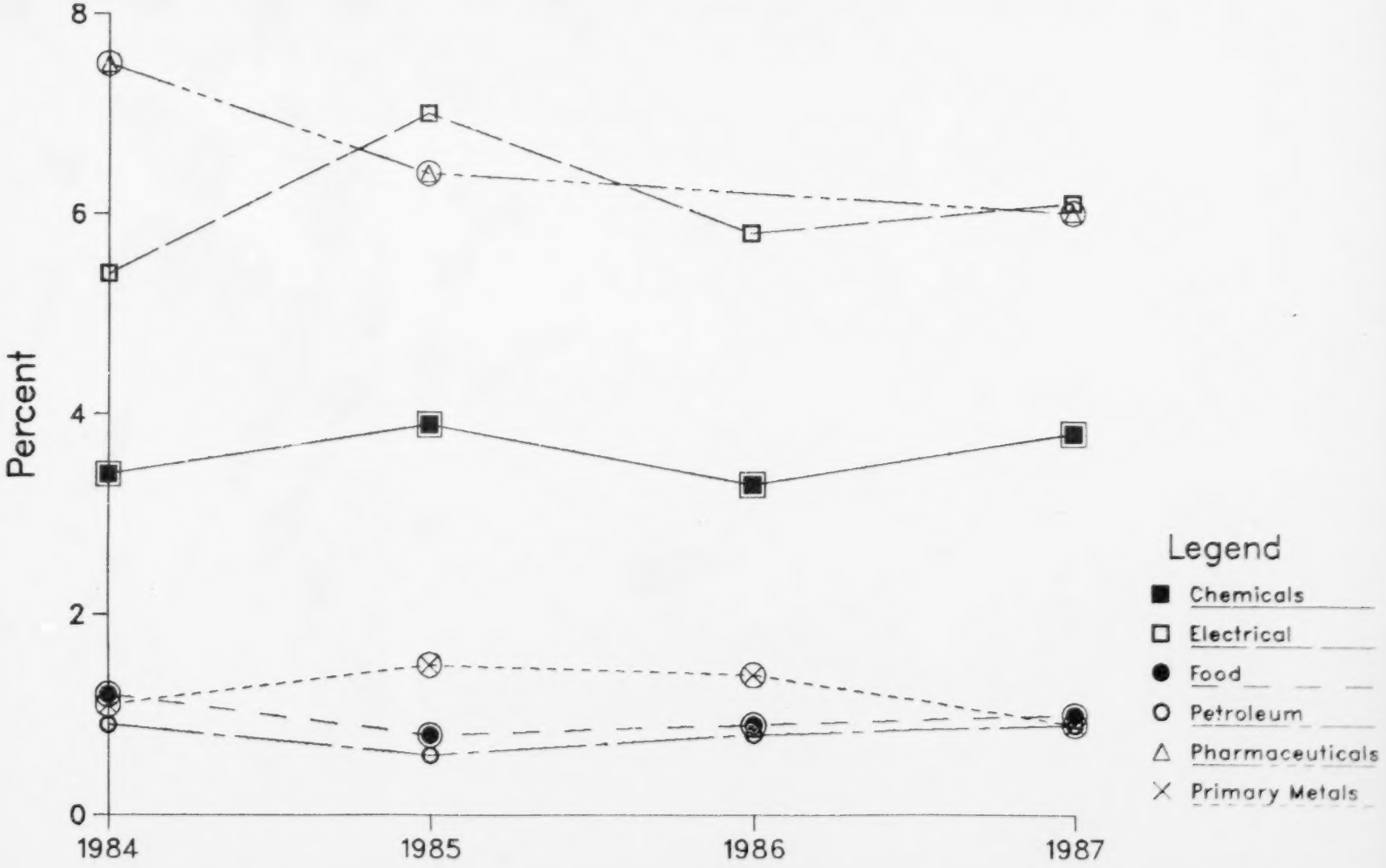
*Research whose outcome may be unknown at the time the work is undertaken but where there's a reasonable expectation that findings will be valuable to the supporting organization.

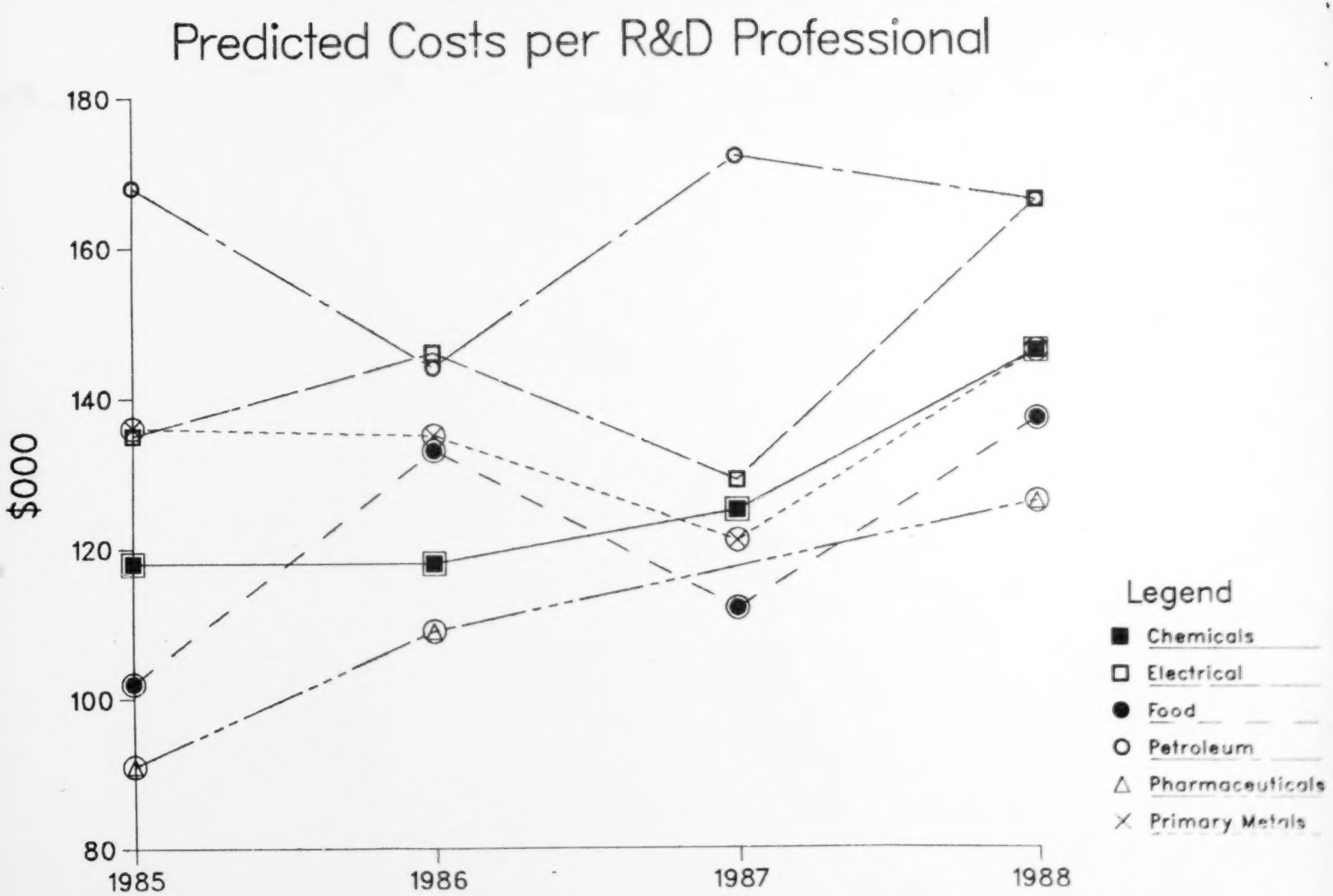
**Refers to actual cost of operating the laboratory. Numerator consists of such costs as salaries (professional and non-professional), fringe benefits, travel, training, supplies, secretarial, managerial, analytic and testing services in-house and outside, utilities, taxes, and depreciation. Denominator includes total number of technical professionals at the laboratory whether in technical or managerial activities.

Predicted Value of R&D as a Percent of Sales



Reported Value of R&D as a Percent of Sales




Predicted Costs per R&D Professional
$000
180
160
140
120
100
80
1985
1986
1987
1988
Legend
Chemicals
Electrical
Food
Petroleum
Pharmaceuticals
Primary Metals

Reported Costs per R&D Professional